

Patent Application of Russell J. Fischer for "Method and Apparatus for Prediction of
Cardiac Dysfunction" continued

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Claims: I claim:

1. A method comprising the steps of :

sensing a first electrical signal from a patient's heart indicative of the rate of depolarization of a chamber or chambers of said patient's heart;

sensing a second electrical signal from said patient's heart indicative of the rate of depolarization of a chamber or chambers of said patient's heart;

assessing said first electrical signal to characterize changes in the rate of depolarization of said chamber or chambers of said patient's heart over a period of time and issuing a first signal indicative of the magnitude of the rate modulation;

assessing said second electrical signal to characterize changes in the rate of depolarization of said chamber or chambers of said patient's heart over a period of time and issuing a second signal indicative of the magnitude of the rate modulation;

analyzing said first signal indicative of the magnitude of the rate modulation and said second signal indicative of the magnitude of the rate modulation to assess the condition of the heart.

2. A method comprising the steps of:

sensing atrial depolarizations of the heart;

forming an atrial rate signal corresponding to the rate of said atrial depolarizations over time;

sensing ventricular depolarizations of the heart;

forming a ventricular rate signal corresponding to the rate of said ventricular depolarizations over time;

comparing said atrial rate signal to said ventricular rate signal.

3. The method of claim 2 wherein sensing atrial depolarizations comprises:
 - receiving an ECG signal;
 - detecting a sequence of P-waves in said ECG signal;
4. The method of claim 2 wherein sensing atrial depolarizations comprises:
 - receiving an intracardiac electrogram signal;
 - detecting a sequence of atrial depolarizations in said intracardiac electrogram signal;
5. The method of claim 2 wherein forming an atrial rate signal comprises:
 - calculating a time interval between successive atrial depolarizations to determine a magnitude of the atrial depolarization period;
 - forming a time series with the magnitudes of said atrial depolarization periods.
6. The method of claim 2 wherein forming an atrial rate signal comprises:
 - calculating the inverse of a time interval between successive atrial depolarizations to determine a magnitude of the atrial depolarization rate;
 - forming a time series with the magnitudes of said atrial depolarization rates.
7. The method of claim 2 wherein sensing ventricular depolarizations comprises:
 - receiving an ECG signal;
 - detecting a sequence of R-waves in said ECG signal;
8. The method of claim 2 wherein sensing ventricular depolarizations comprises:
 - receiving an intracardiac electrogram signal;
 - detecting a sequence of ventricular depolarizations in said intracardiac electrogram signal;

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9. The method of claim 2 wherein forming a ventricular rate signal comprises:
 - calculating a time interval between successive ventricular depolarizations to determine a magnitude of the ventricular depolarization period;
 - forming a time series with the magnitudes of said ventricular depolarization periods.
10. The method of claim 2 wherein forming a ventricular rate signal comprises:
 - calculating the inverse of a time interval between successive ventricular depolarizations to determine a magnitude of the ventricular depolarization rate;
 - forming a time series with the magnitudes of said ventricular depolarization rates.
11. The method of claim 2 wherein said step of comparing an atrial rate signal to a ventricular rate signal comprises:
 - calculating a measure of atrial rate modulation of said atrial rate signal;
 - calculating a measure of ventricular rate modulation of said ventricular rate signal;
 - calculating a measure of the similarity of said measure of atrial rate modulation and said measure of ventricular rate modulation.
12. The method of claim 2 wherein said step of comparing an atrial rate signal to a ventricular rate signal comprises:
 - calculating a measure of atrial rate modulation of said atrial rate signal;
 - calculating a measure of ventricular rate modulation of said ventricular rate signal;
 - displaying said measure of atrial rate modulation and said measure of ventricular rate modulation to a human user for visual comparison.
13. An apparatus comprising:
 - first means for sensing electrical signals from a patient's heart indicative of the depolarization of a chamber or chambers of said patient's heart;

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second means for sensing electrical signals from said patient's heart indicative of the depolarization of said chamber or chambers of said patient's heart;

first rate modulation assessment means, coupled to said first sensing means for characterizing changes in the rate of depolarization of said chamber or chambers of said patient's heart over a period of time and issuing a signal indicative of the magnitude of said rate modulation;

second rate modulation assessment means, coupled to said second sensing means for characterizing changes in the rate of depolarization of said chamber or chambers of said patient's heart over a period of time and issuing a signal indicative of the magnitude of said rate modulation;

means for analyzing said magnitude of atrial rate modulation and said magnitude of ventricular rate modulation to assess the condition of the heart.